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Volume 5 | Issue 2

Shah, E. 2012. Seeing like a subaltern – Historical ethnography of pre-modern and modern tank irrigation technology in Karnataka, India. Water Alternatives 5(2): 507-538



## Seeing Like a Subaltern – Historical Ethnography of Pre-Modern and Modern Tank Irrigation Technology in Karnataka, India

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**ABSTRACT:** In various avatars the images of pre-modern knowledge and social organisations, also differently described as pre-colonial or traditional, are projected as alternative to the modern technologies and forms of governance not only in India but also elsewhere. I first review a few such representations of the idea of pre-modern invoked from politically diverse positions in order to demonstrate a unifying characteristic among them that form a 'view from the above'. I show how a situated position – seeing like a subaltern – can provide a way forward from the mutually opposing binary categorizations of the pre-modern and modern. Extensively referring to folk literature, I discuss here the historical ethnography of tank irrigation technology in Karnataka that covers both medieval and modern periods. I show how the technical designs of this thousand years old technology significantly transformed from the pre-modern to the modern times and how in each epoch the reproduction of the technology implied the reproduction of radically different social and cultural spaces and, most significantly, social and power relations.

**KEYWORDS:** Tank irrigation technology, pre-modern Knowledge, anthropology of technology, Karnataka, India

### INTRODUCTION

Images of the pre-modern have prominently influenced debates on irrigation in India and elsewhere in the world. In various avatars pre-modern knowledge and social organisations, also differently described as pre-colonial or traditional, are projected as alternative to modern technologies and forms of governance. These debates took an influential turn in India since the opposition against a large dam on river Narmada in the 1980s. Among many other objections, the large dam was opposed as a symbol of the domination of Western and modern technology. However, the invocation of the pre-modern as a critique of the modern has been widely criticized as modernity's representation of its 'other'. It has been widely shown how the agency ascribed to the idea of the pre-modern (or traditional) is not only founded on a binary opposition of the modern and non-modern but also embedded in the particular forms of imagination of the past and present and hence far from being historically accurate.<sup>1</sup> Despite the widespread and longstanding criticism of the invented nature of the pre-modern, the idea has not only continued to inform political and policy debates, but has also been widely invoked in critical scholarship in the social sciences (Harding, 1994; Lansing, 2006; Scott, 1998).

<sup>1</sup> There is a significant body of literature that shows the 'constructed' nature of the idea of the pre-modern. Although Agrawal does not talk about the relationship of indigenous knowledge with the pre-modern form of knowledge, Agrawal's essay on dismantling the difference between the indigenous and modern forms of knowledge has been widely cited (Agrawal, 1995). I will further discuss David Mosse's equally influential work on the way in which the colonial government invented the idea of community for its own administrative purposes (Mosse, 1999). In my own earlier work, based on the extensive folk literature, I concluded that it would be difficult to find any fundamental ontological difference between a pre-modern tank irrigation technology and a modern technology (Shah, 2008). Based on archeological and historical evidence, Morrison comes to the same conclusion that pre-modern irrigation systems differed in no fundamental or essential way from modern ones (Morrison, 2010).

Here, I aim to first review a few such representations of the idea of the pre-modern invoked from politically diverse positions. The choice of these examples is not exhaustive. I do not aim to review the whole range of such representations. The examples discussed here are only to demonstrate a certain unifying characteristic among these representations despite the politically disparate vantage points from which they are invoked. I aim to show that while these imaginings serve a wide range of different political purposes, they end up reifying binary oppositions between the pre-modern and modern because they invariably provide a 'view from the above', which Donna Haraway called "a view from nowhere and everywhere" (Haraway, 1988). On the other hand, the critiques of these forms of reified representation often end up erasing the difference between forms of knowledge emerging from different social and historical contexts (Agrawal, 1995). In throwing a reverse gaze – the modern gaze on the pre-modern – these critiques fail to acknowledge the significant differences between the knowledge emerging from different historical epochs.

In the second part of the essay, proposing a methodological alternative to go beyond the reductionist opposition on the one hand and the 'dismantled difference' on the other, I join a number of other critical voices that are redefining debates on water. Mollinga reviews critical scholarship and policy debates on agricultural water use in India which he thinks are caught between strategic essentialism and analytical reductionism (Mollinga, 2010). The strategic essentialism is sustained by the clamours on binary opposition between state-village and state-community, (which referring to Kaviraj, Mollinga traces to the way pre-modern, colonial and postcolonial states operated), and the resulting analytical reductionism overemphasises the village and community institutions and pays scanty attention to the way state functions at the local level. Mollinga's proposes his own way forward by proposing to focus on changing material conditions, especially the impact of the processes of economic liberalisation and globalisation on water use. What Mollinga calls silences, however, have been variously broken in the last decade or so, the most noteworthy among these broken silences is the growing literature on cultural politics of natural resources (Baviskar, 2003, 2007). This growing body of literature goes beyond the "dull rigour of economic determinism" and focuses on "lived experiences and sedimented histories of situated cultural practices and places" (Baviskar, 2003). The focus in cultural politics of natural resources is to understand the way in which multiple fields of power manifest in contradictory and complex ways and the way in which struggles over resources are simultaneously about identities and interests, and about symbolic capital and material economy (Mosse, 1997, 2003). Joining this line of critics and breaking what Mollinga calls a silence, I evaluate here the pre-modern and modern tank irrigation technology to show how a situated position – seeing like a subaltern – can provide a way forward from the mutually opposing binary categorizations of the pre-modern and modern.

I have used the category of subaltern here in the broadest terms – to designate the subordinated interests and positions of marginality. The term subaltern here is a short hand for denoting the expression of power relations in design, construction and control of irrigation works. The term broadly represents the position of marginality, especially the social anxiety and environmental uncertainty caused by the technological designs shaped by these power relations. In other words, seeing like a subaltern would mean looking at tank irrigation systems from below, from the perspectives of those whose interests and whose lives were compromised in the development, spread and functioning of this technology both in pre-modern and modern periods. Seeing like a subaltern would therefore mean explaining the ways in which the social anxiety generated in the times of environmental uncertainty, which in itself could be explained as a manifestation of the technological designs, resulted into acts of violence against the marginal sections of society during the medieval periods. In the modern period seeing like a subaltern explains the way in which newer forms of power relations since the introduction of green revolution have generated newer forms of marginality.

The discussion thus covers the historical ethnography of tank irrigation technology in Karnataka that has sustained over both medieval and modern periods.<sup>2</sup> I have shown how the technical designs of this thousand years old technology significantly transformed from the pre-modern to the modern times and how in each epoch the reproduction of the technology implied the reproduction of radically different social and cultural spaces and, most significantly, social and power relations. By extensively referring to the folk literature – songs and stories – I have done subaltern history of the tank irrigation technology in the medieval period to show how the key technical designs of the technology were reproduced by using institutionalised forms of forced labour. I also argue that a number of popular folk songs on a woman being sacrificed in the tank on the face of the looming threat of drought and water scarcity point out that the tank technology was a source of social anxiety, uncertainty, and violence during the medieval times. Moving on to the modern period, I further show how several key designs of the tank irrigation structures in Karnataka radically transformed as a result of the shifting power of the farming elites since the introduction of the green revolution. In radically different ways, then, the tank irrigation technology in both pre-modern and modern times has not been amenable to democratic, communitarian or egalitarian forms of governance. In both epochs, the technology has been the site upon which the complex power relations are articulated.

### SEEING FROM THE ABOVE: COLONIAL AND NATIONALIST REPRESENTATIONS OF TRADITION

The beginning of the imaginings of the pre-modern could be traced to the advent of modernity itself. Both the colonial and the nascent post-colonial state in-the-making extensively referred to the agency of the traditional. The civilising mission of the British in India, to dominate in order to liberate, was a profoundly contradictory enterprise. Prakash argues that "the British positioned modernity in colonial India as an uncanny double, not a copy, of the European original – it was almost the same, but not quite" (Prakash, 1999). This positioning of modernity involved translation between the modern and traditional and also the actors who could do this translation. The process of translation, however, involved the reinterpretation, and to some extent, the 'invention' of the traditional. In his detailed historical ethnography of ideologies of tank irrigation development in South India, Mosse shows how the colonial government in nineteenth century 'invented' the custom and tradition of 'village communities' for its minor irrigation administration (Mosse, 1999). In the context of the recurring famines in the Madras and Mysore presidencies in the late nineteenth century, the colonial government was faced with a moral task of maintaining thousands of dispersed minor irrigation structures. The financial and administrative burden this implied was insurmountable. The British responded to this mammoth task by positioning the tank systems in the state of decay and decline which was further related to, on the one hand, the moral and administrative disorder of the preceding regimes, and on the other, to the loss and decline of the traditions of communal labour and village institutions for the tank maintenance and management (Mosse, 1999). Mosse shows how the British administration went to a considerable length to amass evidences for the existence of such institutions, rooted in pre-colonial traditions, and how it framed laws and rules to reinstate such 'invented' traditional collectivities (Mosse, 1999). The positioning of the rule of law of the modern state was thus based on the incorporation of the language of custom and tradition (Gilmartin, 1994).

<sup>2</sup> I would like to clarify that the social and power contexts of tank irrigation technology in the state of Karnataka is emphasised in this paper. This does not mean that the literature on tank irrigation in other parts of South India – Tamil Nadu, Andhra Pradesh and Kerala – is not relevant. In fact, given that the Vijayanagara Empire covered much of South India during the medieval time, it would be difficult to discuss the situation of Karnataka as a separate geographical block. However, I have deliberately tried to focus only on Karnataka for the tank irrigation in the modern period. This is also because since the British period an overwhelming scholarly and policy attention is given to tank irrigation technology in Madras Presidency and subsequently to Tamilnadu. There is often a tendency to view the tank irrigation situation in other parts of South India from the lens of the experiences in Tamilnadu. At some other time and place I would like to compare evidences from Tamilnadu and Karnataka, but here I expressly wish to discuss the nuances of the tank irrigation technology in Karnataka.

Underlying this translation – the representation and invention of the tradition – was the rearranging of power relations between the colonised and the coloniser (Prakash, 1999). Another such rearrangement of power relations in the mid twentieth century also happened around the reinterpretation of the traditional, this time involving the nationalists – those Indians who wanted the British to leave India (Zachariah, 2005). On the face of the impending independence, the task in front of the nationalists was to build an authentic nation that was modern but not Western. The nationalists, who were largely western educated middle class intellectuals, were engaged in debates on what path should independent India take after the British left. These debates on 'possible nations' in the 1930s-1950s happened around the futuristic themes of 'development' and 'improvement', however, these constructions of the future were based on the reinterpretation of the past in the same way as their colonial counterparts did, but with the contrasting images of the past. The western-educated elites and indigenous reformers reinterpreted the classical Hindu religious texts and traditions in the light of the modern, scientific and western discourse (Prakash, 1999). These texts were now reinterpreted as 'scientific', and rational and authentic, upon which the universality of the modern Indian nation could stand. Not only that through the interpretation of the archaic that the modern nation was cast as homogenous, whole and Hindu (Prakash, 1999) but also that through the representation of the tradition that the Indian modernity was cast as distinctly different from the Western modernity and hence authentic.

### SEEING FROM THE ABOVE: CRITICAL SOCIAL SCIENCE SCHOLARSHIP

In contrast to the governmentality of the colonial state and the nation-building of the indigenous elites, the agency ascribed to the pre-modern in the critical social science is rather different. Recent scholarship has posed important challenges to the epistemological dominance of the European Enlightenment and Western science, technology, and modernity. The pre-modern or 'outside of modern' technologies and ways of knowing are not only posed as a counter-hegemonic challenge, but, as some would insist, they form a viable or desirable alternative to modernity. These forms of knowledge and practice are claimed to be substantively, epistemologically, and contextually superior to modern science and technology. At the same time, scholars also freely associate them with other desirable traits, such as decentralization, democracy, bottom-up planning, and even self-organizing spontaneity. Much of this literature supposes that the superiority of pre-modern knowledge systems and artefacts originated in the superior pre-modern cultural context from where modernity is perceived as lacking, inadequate and insufficient. Below I review a few of such currently influential literature.

James Scott, in his influential book *Seeing Like a State*, proposes the Greek concept of *metis* to mean the local, implicit, embedded, practical experience of knowledge and compares it with the abstract, general knowledge deployed by the modern state agencies. Although Scott does not label this form of knowledge 'traditional' and often alludes to imply it as 'practical knowledge', his critique of the modern state and his deployment of the concept of *metis* are nevertheless based on an idea of the pre-modern state. Scott (1998) writes,

[t]he pre-modern state was, in many crucial respects, partially blind; it knew precious little about its subjects, their wealth, their landholding and yields, their locations and their very identity. It lacked anything like a detailed map of its terrain and people. It lacked, for the most part, a measure, a metric, that would allow it to 'translate' what it knew into a common standard necessary for a synoptic view. As a result its interventions were often crude and self-defeating.

Scott further argues that in contrast of the pre-modern state the modern European statecraft is devoted to creating a rational order through rationalization and standardization. In creating the designed and planned social order, the modern state operates through the manipulation and control of its subjects. What is interesting is that while Scott relates two contrasting forms of knowledge with the contrasting forms of statecrafts (as in the quotation above), he does not further elaborate on how the

pre-modern form of knowledge is embedded in the form of statecraft. However, the Greek concept of *metis* is later in the book elaborated as forms of informality and improvisation based on practical and local experience, which, Scott argues, emphasizes process, complexity, transiency, and open-endedness. Scott further discusses this concept as representing the knowledge that involves rules of thumb in contrast to the knowledge that is based on deductive principles transmitted through book-keeping. In the rest of his book, through detailed discussions on several case studies, Scott powerfully demonstrates the forms of knowledge employed in the domineering and controlling practices of the modern state-craft. The concept of *metis* is thus clearly 'invented' (my word) which is ascribed an agency of critiquing the violence of 'seeing like a state'.

What is not convincing in Scott's schema of knowledge is the absolute necessity of the association of *metis*-form of knowledge with the ancient Greek-ness and even with the pre-modern state. In social sciences many such concepts referring to the modern society, for example, Pierre Bourdieu's discussion on phenomenology of tacit knowledge, and Levi-Strauss's concept of bricolage, which Scott briefly mentions, have similar derivatives. Scott's own discussion in explaining the nature of *metis* employs the examples of a boxer, a soccer player, and a war diplomat which betrays the implied non-modern-ness of *metis*. In the absence of any discussion on the kind of society, state and social order from which the *metis* originates, I am implied to argue that the reference to the non-modern or ancient roots of *metis* here is more driven by the search for the 'utopian outsider' of modernity rather than the historically compelling evidence of a superior location.

Another influential scholar, Stephen Lansing, locates his arguments in the historical and cultural context of Balinese society. He proposes that a holistic cultural approach that is attentive to indigenous systems of order can solve many contemporary political predicaments. Calling it a 'perfect order', Lansing argues that the centuries-old traditional system of the water temple in Bali achieved a balanced ecology without recourse to centralized state power. Balinese irrigation is ecologically hierarchical but socially democratic, which, Lansing suggests might have been developed through spontaneous self-organization (Lansing, 1991). For Lansing, this culture, with its deep roots in the pre-modern times, is an alternative rationality to the pervasive economization of modern times. In his subsequent book, Lansing asks how Western social science might look like from a magical Balinese perspective (Lansing, 2006). While the former is formed around the emergence of modern, autonomous self-hood and the principle of equality, the pre-modern, Balinese worldview, based on both the Hindu Brahminical and Buddhist religious practices, is based on the principles of hierarchy on the one hand, and the emotional self-mastery on the other. Different notions of self-hood inaugurate different forms of governance. In other words, the subjective awareness of individual connects to the objective conditions. The emergence of the autonomous subject is associated with the rise of totalitarian rationality in Western thought, whereas in contrast, Lansing explains, pre-modern Balinese thought derives from magic and the ideas of self-mastery and awareness of interdependencies which forms the egalitarian, self-regulating farmers' organizations called *subaks*. The control of self through the control of emotions and unruly passions go hand in hand with the ordering of the outer (natural) world (Lansing, 2006).

Lansing thus contrasts the pre-modern and modern forms of subject formation and methods of governance. Lansing bases his claim that the traditional irrigation organisations such as *subaks* have been egalitarian and democratic on the assertion that there was an absence of the Great Designer or a centralised, despotic or bureaucratised pre-modern state invested in building irrigation facilities. However, such absence of despotic centralised authority does not rule out other forms of enactment, entrenchment, and diffusion of power. It would be a great sweep to equate the absence of the Great Designer with decentralisation or forms of self-organizing, democratic, community-collectives. The extent to which the pre-modern Balinese state was involved in constructing and managing irrigation facilities was a key question that drove the decade long controversy among historians and anthropologists. The question whether Balinese irrigation was entirely controlled by *subaks* and hence decentralised and democratised or controlled by some form of kingly centralisation remains yet equivocally unanswered. This debate was recently re-opened. Stephen Lansing and Clifford Geertz's

conclusion that the pre-modern Balinese state was weak or symbolic and correspondingly the decentralised and democratic organisations of *subaks* remained at the helm of the irrigation affairs is challenged by Hauser-Schaublin, who argues that the pre-modern Balinese state was neither symbolic nor weak (Hauser-Schaublin, 2003). She proposes a different model of the pre-modern Balinese state, which, she argues, derived its power and authority from mobilising a large number of neighbourhoods to repeated pilgrimage to temples, by means of which people from unrelated areas were brought together to form localities. According to her, state authority and power manifested in an entirely different way than those modelled on modernist theories. Hauser-Schaublin alleges that the earlier theories of the Balinese state being a theatre state as argued by Clifford Geertz and a democratic irrigation model presented by Stephen Lansing were based on the selective reading of empirical sources (Hauser-Schaublin, 2003). As I already discussed above, in invoking the agency of the pre-modern Balinese worldviews rooted in Hindu and Buddhist traditions, Lansing shows the third alternative to centralisation-decentralisation dichotomy (Lansing, 2006), however, the extent to which his own computer-simulated, conceptual model of self-organising temple networks (Lansing, 1991) bore resemblance to the actual history of Balinese irrigation remains ambiguous.

Another such powerful trend of post-colonial historiography of science and technology, which is sometimes portrayed as a "second historiographic revolution" (Harding, 1994) or described as a thousand flowers bloomed (Raina, 2003), relates to the idea of the pre-modern. A leading scholar in science and technology studies, Sandra Harding, poses a probing question: whether natural sciences are multicultural, and to what extent modern science has origins in the non-modern cultures. She proposes that the indigenous and non-Western scientific traditions should be strengthened, re-valued, and integrated as a model for the global and democratic sciences of the future (Harding, 1994). In the historiography of sciences, the post-colonial frame is the most recent and internally diverse one (Raina, 2003). Among post-colonial science and technology historians, the revivalist standpoint refers to the pre-colonial forms of knowledge. Raina shows how this historiography often end up projecting the mirror-image of Eurocentrism that post-colonial studies otherwise aim to critique (Raina, 2003). Knowledge systems and artefacts of the pre-colonial era largely emerge in the revivalist studies at best as fragments or facets that serve either as a benchmark against which the level of pre-colonial civilization is measured or as a way of exploring and charting the transformations brought about by colonizers (cf Alvares, 1991; Kumar, 1997; Qaisar, 1998). Such studies largely approach pre-colonial science and technology with the quintessentially colonial question: What was the level of sophistication of 'Indian knowledge systems' before the British conquest? Against the background of the European experience, pre-colonial Indian science and technology emerge as a mirror image of the one generated by the hegemonic project of the British, albeit turned upside down. The post-colonial answer to the colonial question – namely, whether Indian science and technology were sophisticated enough – invariably ends up being affirmative.

### SEEING LIKE A SUBALTERN

In the above examples, despite the vast differences in the purpose and manner in which the agency of the pre-modern is invoked, there is a tendency to make pre-modern knowledge systems and artefacts into reified objects of virtue irrespective of their social and historical location. In critical social science, the detailed mapping of the social context of pre-modern forms of knowledge remains elusive. While a number of critical social science studies raise significant political and historical issues with respect to technological change and modernity, they throw very little light on the social shaping of pre-modern knowledge systems – a subject that barely exists in its own right. As a result, claims of epistemic and cultural superiority – or even substantive equality – between pre-modern and modern knowledge systems involve, in the words of Shigehisa Kuriyama, "asserting comparability without even comparing". "The only way to advance", Kuriyama further suggests, in response to Harding's multiculturalism, "towards a genuinely pluralistic appreciation of knowledge in different cultures is actually to study

cultures, earnestly, humbly, in detail, over a long time. By itself, the most thoroughgoing critique of western universalism contributes nothing" (Kuriyama, 1994).

In her recent work, Harding makes a different argument. She wants to re-evaluate the binary of tradition-modernity, which she thinks remains powerful in shaping research and policy, because such binary renders the traditional cultures as feminine and primitive (Harding, 2008). The success of the modernity and its attendant values of objectivity, rationality, progress and science are measured in terms of their distance from the feminine and primitive. Harding proposes that the modern science should be considered only one among many ways of knowing and also that this science must be examined from below – from the standpoint of women and other least advantaged citizens (Harding, 2008). Below I aim to examine tank irrigation technology from the below, from the standpoint of the disadvantaged positions in both pre-modern and modern periods.

### Seeing like a subaltern: Pre-modern tank technology, state and labour organization

The kingdoms in early South India between roughly the eighth and sixteenth centuries AD rose and fell on their ability to extract and sustain agricultural production, which in turn rested on the effective control of water. The practice of constructing and using tank irrigation systems started in the early centuries of the first millennium AD.<sup>3</sup> Technically speaking, a tank can be described as a miniature version of a large dam. Water is impounded behind an earthen embankment and is released through sluices into canals to irrigate downstream land. Excess water from the reservoir is allowed to escape through waste weirs. Figure 1 provides a schematic diagram of the technical principles of these tanks. Tanks usually receive water from a seasonal rivulet, a drainage channel, a tributary, or a canal. Unlike large dams, tanks are almost never constructed directly on perennial rivers. Further, they are usually constructed in chains so that the overflow from an upstream tank forms the inflow into a downstream tank. In other words, although tanks are spatially dispersed, they are actually hydrologically linked. At present there are thousands of tanks, irrigating anywhere from ten to a thousand hectares, scattered across South India. Roughly 38,000 are in the state of Karnataka alone, which, according to a survey done in 1986-87, supply 19 percent of the total irrigated area in the region (Vaidyanathan, 1998).

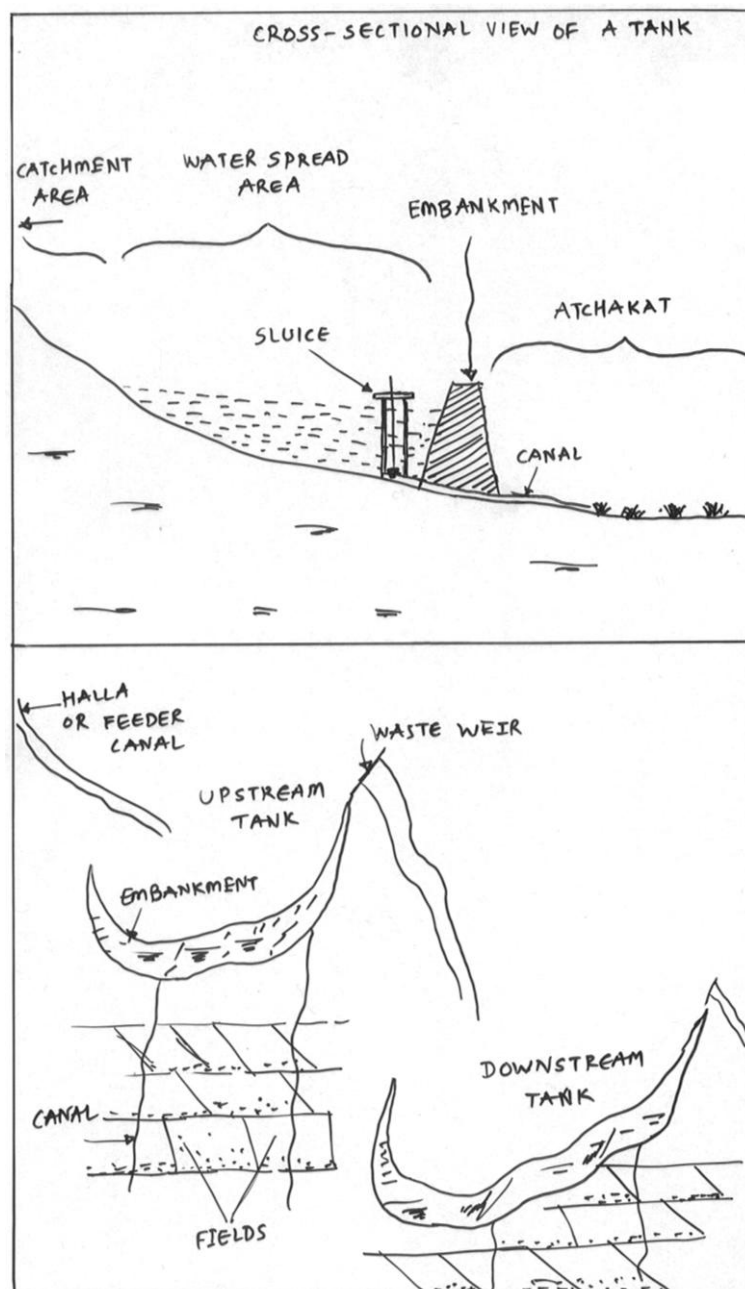
The period between the seventh and tenth centuries saw wider utilization and effective management of hydraulic technology in South India. This growth coincided with agricultural expansion, especially with the spread of irrigated rice paddy cultivation (Ludden, 1985). Tank construction in Karnataka reached its zenith during the Vijayanagara period (AD 1300-1700), when the tanks were expanded in upland regions across South India, particularly in the ecological areas that some scholars identify as 'mixed zone' to distinguish them from other areas that were primarily wet or dry. These areas are considered marginal because they were less preferred for human settlement, and agriculture expanded to them only later (Breckenridge, 1985; Heitzman, 1997; Ludden, 1985; Mosse, 1997).

Different dynasties ruled South India during the thousand-year period between the seventh and seventeenth centuries. Some historians, however, argue that there existed a fundamental continuity during this time with respect to several important aspects of society and culture. Burton Stein called this a pyramidal, segmentary state, one that was integrated culturally but decentralized politically. It was religious and symbolic order, rather than military might, that bound the state together. In this pyramidal state, tanks and temples linked localities with central authority (Stein, 1980). The period of the Vijayanagara empire, which claimed political hegemony over most of South India between AD 1300 and 1750, was marked by the expansion and intensification of agriculture, a process in which temples and tanks became linked together to create what Carol Breckenridge calls *social storage* (Breckenridge, 1985). Social storage involved two practices: creating tanks to store water for agricultural production, and using temples to collect, share, and redistribute agricultural surpluses, keeping some in reserve as

<sup>3</sup> The earliest written records available on the construction of tanks date from the third century BC. The earliest record of a tank in south India refers to the tank that existed at Inamgoan, near Pune, in 1500 BC (Dikshit et al., 1993; Gurukkal, 1986; Srinivasan, 1991).

insurance against hard times. Temples were at the helm of moral and economic transactions and provided an organizational framework for the creation and redistribution of agricultural surplus. The local elite (made up of institutions, corporate groups, and individuals) donated money and land to temples. These donations, or endowments, were used to construct irrigation networks and expand agriculture in the land granted to the temples. Part of the additional income generated by this expansion was offered to temple deities in accordance with donors' stipulations, and part was claimed by local elites as returns on their investments. Temples and tanks were therefore the backbone of social and agricultural expansion into the mixed zone.

Figure 1. The technical principle of tanks (not to scale).





Although the historical literature is thus rich when it comes to locating tanks within a certain social order, it rarely discusses the techniques and labor organization involved in tank construction. The first evidence of who might have constructed the network of tanks comes from folk literature. Folk literature on tanks – stories, legends, and songs – originates from three sources. The first set of stories and myths I found were narrated to me by members of the artisan caste of Voddas, who are rarely mentioned in the inscriptional sources or in South Indian historiography but who figure prominently in folk accounts as tank builders.<sup>4</sup> The myths and stories remembered by Voddas are markers of their identity and thus are usually not associated with any particular tank. A second set of stories narrated by higher-caste farmers and temple priests, in which Voddas also figure significantly, are usually associated with specific tanks. The third type of folk literature consists of songs about the sacrifice of women in tanks, and these are usually sung during times of drought and water scarcity by Dalit women – formerly an untouchable, lower caste. Almost every tank in the semiarid region of south Karnataka has a story or a sacrifice song attached to it.

This literature depicts quite a different picture from the collective, communal project of construction some recent scholars assume. Instead, the labor for tank construction seems to come primarily from the Vodda caste. The stories narrated by higher-caste farmers and temple priests and the songs sung by Dalit women commonly describe the large number of Voddas employed for tank construction. For example, in the folksong 'Kanne Viramba', a village chieftain invites seven hundred Voddas to build a tank. This song was sung to me by a group of Dalit women from the village Dannayakankere, which is located close to Hampi, the erstwhile royal capital of the Vijayanagara empire. In another such song, 'Kere Hunnama', the chieftain enters into a lengthy and arduous negotiation with the leader of three thousand Voddas (Rajappa, 1974). Voddas from seven villages were invited to construct a tank in the story about folk hero Dannayakan Mudda narrated as below.

Once upon a time, Dannayakan Mudda, the king of the Vijayanagara kingdom, went around his domain to find out about the welfare of his people. When he passed by a village of Haragnur he felt that it was a beautiful place, suitable for the construction of a tank. After twelve years of worship, the Mudda convinced the deity of the local temple – Anjaneyyaswamy – to help him build a tank. The god modified the Mudda's plan, which would have displaced twelve upstream villages and twelve downstream villages, to shift only three villages upstream and three downstream. The people from these villages formed a new village which was then called Haragnur. The Mudda employed Vodda laborers from seven villages for the construction, but informed Anjaneyyaswamy that he did not have the money to pay them. Anjaneyyaswamy instructed him not to keep any accounts of the Voddas' employment and not to pay them. It took several years to complete the construction of the tank. On the day of payment, according to the instruction of the Anjaneyyaswamy, the Mudda called the Voddas together and made small sand mounds on the ground in front of them. To each he gave a stick and instructed them to pass it through the mound in front of them. As per Anjaneyyaswamy's advice, the Mudda told all the Voddas who complained about finding only a ghughari (a sweet made with wheat and coconut powder) as their payment that this was because they had not worked hard enough, with both physical and mental devotion. Had they worked hard, they would have received instead a gold coin as per the god's wish. The tank was completed, but it did not receive enough water to fill it. The Mudda started to worry and again contacted the god. This time Anjaneyyaswamy said that the tank needed a human sacrifice and decreed that seven daughters of a family in the nearby village should be sacrificed in the tank. The father was contacted and, after some persuasion, agreed to sacrifice his daughters for the welfare of the village. Accordingly all the daughters were taken to the embankment in a festive procession. After worshipping the god, they were asked to enter small rooms made in the embankment and the doors were shut behind them. An idol of the youngest girl is installed on one of the sluices of the tank. The girl is worshiped and called Kaneramma.

<sup>4</sup> In the present days, Voddas no longer participate in tank construction; they are largely employed as menial laborers for road building, setting telephone lines and underground pipes, construction, stone work, and so on. They live in separate villages and are not closely associated with agricultural activities.

A temple priest told me this story in 1999 during my field work. The same folk hero also figures in the songs sung by Dalit women. None of the stories and songs suggests a collective, community-based construction of tanks. While villagers' and temple priests' stories and songs clearly illustrate that Voddas built thousands of tanks over the span of several centuries, the Voddas' own narratives hint that they may have been under some form of coercion when they did so. The recurring and central theme of the legends narrated by Voddas pertains to their grievances about not being paid, being paid inadequately, or receiving payments that have been disguised. The theme of Voddas making unreasonable or insatiable demands on their employers also recurs in other legends. One such story, recorded by a British ethnographer, goes like this:

One sultry day, Siva and Parvati (a god couple) were walking upon the earth, when they got very hot and thirsty. The drops of perspiration which fell from Siva were changed by him into a man with a pickaxe and crowbar, while those falling from Parvati turned into a woman carrying a basket. The new pair of man and woman quickly sunk a well, and with the cooling waters god and goddess refreshed themselves. In gratitude, they promised the labourers certain gifts. The nature of the gift did not satisfy the man and the woman and both grumbled, which so incensed Siva that he cursed the pair and their descendants to earn their bread only by digging wells and tanks. Paraphrased from (Thurston, 1909).

In another story, the god offers the Voddas a disguised payment. Responding to the Voddas' pressing demand for payment, the god Siva hollows a measuring rod, fills it with gold coins, and gives it to the *maistry* (leader of a group of Voddas), who unwittingly pawns it in exchange for a *toddy* (a liquor). The god then plays another game with the unsuspecting Voddas. He buries a pumpkin filled with gold coins in the ground where the Voddas were digging. Noticing the raised mound caused by the buried pumpkin, they leave it untouched to show the depth of earth they had dug. A buffalo, which was grazing in the field close by, exposes the pumpkin, which the Voddas, unsuspecting of its contents, sell to a local shopkeeper. In these stories, Voddas present themselves as being eternally cursed by the gods: their situation is fated and not subject to changes in dynastic rule.

This folk literature describes characters and processes that resemble certain real people and practices of the Vijayanagaran era, as interpreted by traditional historiographic methods. Real-life historical entities masquerade as folk characters. For instance, the folk hero Dannayakan Mudda resembles the king of the Vijayanagara empire who constructed several important tanks around the royal seat at Hampi. The *gowda* – the village chieftain who either owns the village or has substantial rights over the produce from the village land – whose daughters or daughters-in-law are sacrificed in the tanks behaves in ways consistent with our understanding of the chieftains of the Vijayanagara period. Gods appearing as local deities like Anjaneyyaswamy can be read as the close involvement of local temples in the process of tank construction.

Various forms of these oral narratives point to the long-term continuity of the social and ideological context within which the Voddas' labor was extracted. There are indications in the historical literature on South India that the labor for construction activities was, in general, politically and ideologically controlled and even coerced by the elites since the early medieval period. What are still being debated are the nature and form of this forced labor. Should it be considered compulsory – labor extracted in lieu of tax payments, for example – or simply forced or coerced? For instance, Tejaswini Yarlagadda, in her study of inscriptions from the western Deccan (the heartland of tanks now located in the neighbouring state of Andhra Pradesh), suggests that the practice of *visti* – the imposition of forced labor – began in the ninth century AD. The recipient of the land grant was given the right to impose forced labor and was provided immunity for doing so. Yarlagadda further observes that the frequency of the term *visti* in inscriptions increased in the period between the ninth and tenth centuries and disappeared in the period between the tenth and thirteenth. However, she argues, quoting other sources, that the disappearance of the term may be due to the commutation of forced labor into

money payments and not to the elimination of the practice altogether (Yarlagadda, 1993).<sup>5</sup> Therefore both the folk and the historical literature provide strong evidence to suggest that tanks in the Vijayanagara period were not constructed collectively by communities. Instead, elites extracted the Voddas' labor through some form of coercion.

### Seeing like a subaltern: Social and environmental adaptability

Tank technology has been acclaimed not only for its cultural embeddedness in the regions of South India, but also for its environmental sustainability. Tanks are considered a more environmentally appropriate form of water management than large dams, because they are small and store water in a dispersed and decentralized fashion. Without disputing the argument regarding the comparative environmental advantage of tanks vis-à-vis large dams, I argue that tanks were also subject to serious environmental uncertainties (and still are), especially those constructed in the mixed-zone region of Karnataka.

As already discussed, tanks were increasingly constructed in mixed habitats, largely in south Karnataka, to expand rice paddy cultivation away from the fertile riverine areas during the Vijayanagara period (AD 1300-1750). This period was marked by the expansion and intensification of agriculture during a time of long-distance migration, constant warfare, and the resulting social instability, especially during the later centuries of the period. Tanks and temples during this highly volatile period became a source of *social storage* (Breckenridge, 1985). However, the requirements of social storage made tanks constructed in the mixed region vulnerable to the hydrological vagaries of alternate drought and flood, due to the highly erratic inflow of water.

This uncertainty about water availability in mixed-zone tanks was a major concern for British engineers. For instance, a British officer named R.E. Playfair wrote that "the small tank systems on tributary streams must fail: in the first place because the cost of storing the water is too great... and secondly, that as the supply of such tributary streams is likely to fail in seasons of drought, the tanks would be dry at the very time they would be most wanted".

Colonel Playfair wanted to demolish all existing tanks and build them anew at more favourable locations (Playfair, 1866). In recent times, tanks in the mixed-zone region of Karnataka routinely fill up only once in three or four years. Those engaged in development policy routinely ascribe this hydrological volatility to the poor performance, deterioration, and decline of tank irrigation since the colonial period. Based on the assumption of deterioration and decline, a massive program of tank reform and modernization is being implemented in Karnataka. My argument is that the hydrological poor performance is not, as is often argued, a result of the recent apathy of the state in maintaining the infrastructure, but rather is more deeply historical in nature, an outcome of the social and production requirements for which tanks were constructed in the first place. Oral narratives suggest that since they were originally constructed for rice paddy cultivation, tanks in the mixed-zone region have faced hydrological marginality and the resulting uncertainty of water availability for a long time.

The tanks narrated in many stories and songs of folk literature are a source of anxiety either because they have not received any water, or because they are faced with the threat of flood. This hydrological irregularity had other consequences as well. Earthen embankments and foundations subjected to alternate drying and wetting become structurally weak and breach easily during heavy downpours, creating yet another source for the social anxiety depicted in stories and songs. The human drama in

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<sup>5</sup> There is a large corpus of historical literature that point out the existence of some form of coerced labour, although often the details of such forms of labour is missing. "The largest of these irrigation works must have involved labor forces in their construction", but "we have a limited understanding of how these laborers were recruited" (Sinopoli and Morrison, 1995). "There are inscriptional references to the demand for compulsory labour, but it is not clear whether this demand was imposed on all members of subaltern classes" (Palat, 1987). David Ludden also fleetingly mentions that "coerced labor was not unique to the nineteenth century and perhaps was also convenient during temple and tank construction over the centuries", but he does not provide any evidences (Ludden, 1985).

these stories and songs stems from the fact that the artefact around which the drama takes place is vulnerable to an unpredictable environment.

One genre of traditional ballads that tell the story of a woman about to be sacrificed in a tank is testimony to this hydrological irregularity and the resulting technological vulnerability.<sup>6</sup> The woman about to be sacrificed usually belongs to the family of the village chieftain, who has invested in constructing the tank and whose fortune would be at stake if it did not receive any water. There are several versions of these songs, each named after the woman sacrificed. One, called 'Kerege Haara', is famous in Karnataka and is considered an especially fine work of poetry; it occupies a prominent space in the Kannada literature and is considered a symbol of Kannada nationalism and identity.<sup>7</sup> There are also other versions – again, each named after the woman sacrificed and deified – such as Madagada Kenchamma, Kere Hunnamma, Anajee Honnamma, and Kaneramma (Rajappa, 1974). Although these songs differ in terms of their content, style of narration, and the name and context of the social actors depicted, they all broadly narrate the pathos and plight, love, longings, and desires of the women about to be sacrificed.

A brief overview of one such song, 'Voddar Boyi', follows: The *gowda* (village chieftain) invites the Boyi, a leader of a group of Voddas, and asks him to build a tank in one week. The Boyi negotiates and agrees, but he returns in the third week and complains that the *bund* (embankment) did not stand. The tank in fact asks the Boyi for a human sacrifice in order for the *bund* to stand. When the *gowda* asks who should be sacrificed, the Boyi first asks for the eldest son of the chieftain. The *gowda* refuses to give up his eldest son, and what follows is a lengthy negotiation. The Boyi then demands the youngest son, the youngest daughter-in-law, the *gowda's* wife, and finally the *gowda* himself. The two finally settle on the eldest daughter-in-law. The rest of the song describes her life as she awaits her impending death. Some of the songs also worship or deify the sacrificed woman. For example, 'Kanne Viramba', a song sung by a group of Dalit women from Dannayakankere village, begins with a eulogy to the great victory and glory of a virgin goddess (a young girl sacrificed in a tank) and then tells the story of the tank being built. "Once upon a time", it begins, "a snake with seven hundred heads showed seven bushels of gold coins to the Muddanna [village chieftain] who invited seven hundred Voddas to build a tank. Seven sluices were built in seven years with seven human sacrifices and five more deaths". The song then sings the glory of Muddanna, declares that the tank was built based on moral truth and the principles of moral victory (*dharma*), and finally sings the glory of the virgin goddess and considers her sacrifice the most glorious among all the sacrifices in the tank. Although songs about sacrifice in tanks at the time of floods are rare, I came across at least one popularly remembered story about the sacrifice of a lower-caste man to prevent the breach of an embankment during a time of heavy rain. A *neerghanti* (a lower-caste man employed to distribute water and to watch the physical structures) realized that the tank embankment might give way as a result of the heavy inflow of water due to the heavy rain. Worried, he pleaded with the *gangemma* (water goddess) not to break open the embankment. The *gangemma*, yielding to his prayers, promised that she would not break the embankment until he went to the village, informed the village leaders about the hazard, and returned. The *neerghanti* rushed to the village and informed the leaders about the *gangemma's* promise. The leaders immediately held a meeting and quickly arrived at their decision: they killed the *neerghanti*, cut his body in three pieces, and threw his head to the north, his torso to the south, and his limbs to the west in such a way that his body could not

<sup>6</sup> Alan Dundes describes the traditional ballad as a narrative song whose drama depends upon acts of love and violence. He further argues that traditional ballads and folk legends about human sacrifice have Indo-European origins, where the foundation sacrifice motif tells of technological vulnerability in medieval times across the Indo-European region. In western and northern Europe, there are legends about the sacrifice of illegitimate or fatherless children in the foundations of bridges, dikes, monasteries, palaces, and churches, whereas in southeastern and eastern Europe it is always the sacrifice of women for similar purposes (Brewster, 1996; Dundes, 1996).

<sup>7</sup> In Kannada literature, the song 'Kerege Haara' occupies a prominent place. For an English translation of it, see (Srikantaiah, 1996). For Kannada versions of two songs, 'Madagada Kenchamma' and 'Kere Hunnamma', (see Paramshivaiya and Hanumanthappa, 1994; Rajappa, 1974).

be rejoined. To the *gangemma's* rage, therefore, the man could never return to negotiate. In order to keep her promise to the *neerghanti*, however, the *gangemma* did not breach the embankment.

In certain parts of the mixed zone (the Kollar and Bellary districts), almost every tank has attached to it a story of a sacrifice made to alleviate drought, to save the tank from breaching, or to prevent the embankment from giving way. A small shrine may also exist on an embankment, usually in the name of the higher-caste woman sacrificed to the tank and then deified (almost never in the name of the lower-caste man killed to save the tank). In rare cases, a temple may even exist on the embankment or in the village. Upon entering the dry region of Bijapur in the north and the wet region of Shimoga in the east, the shrines, temples, and sacrifice stories disappear, as uncertainty about water availability for tanks also significantly disappears.

The present-day uncertainty about water availability in the tanks of the mixed-zone region may not be a recent problem, as is often claimed in the literature, but rather may be one that dates back to the earliest construction of tanks in this region. Traditional tank technology is therefore not necessarily entirely in harmony with the environment of the region. Tanks were constructed in a certain social and political context in order to support a certain form of agricultural production, and certainly not with any self-conscious concern over long-term environmental and cultural suitability or sustainability. Tanks were instead constructed on a terrain for which they were not entirely well suited in order to expand rice paddy cultivation during a socially tumultuous period. Hence they were highly susceptible to environmental uncertainties. Furthermore, while the stories lyrically represented in the songs centre around a vulnerable artefact, the social actors in these tales also seem to be acting under duress, to which they respond with acts of social violence: the *gowda* asking the Vodda Boyi to construct a tank in a week; the king leaving his kingdom and camping in a village for twelve years to build a tank; a number of women murdered to alleviate water scarcity or to ensure the safety of an embankment; the ghastly murder of a *neerghanti* to save a tank from breaching. All of these suggest the presence of a high degree of social anxiety regarding tank irrigation, anxiety which results in acts of violence. The folksongs and stories popularly remembered and told by the villagers do not even remotely resemble an idyllic picture of a blissful community living on the banks of a bountiful tank in the pre-modern era.

### TECHNOLOGY OF POWER: MODERN TANK TECHNOLOGY AND GREEN REVOLUTION

In the modern times, especially since the introduction of the green revolution the designs of the tank technology underwent a radical transformation. This transformation happened differently in different socio-historical and ecological zones in the state of Karnataka. Here I wish to discuss the case of Shimoga district located in the wet zone of western Karnataka. I have extensively discussed several such examples in the mixed and dry zones elsewhere (Shah, 2003).

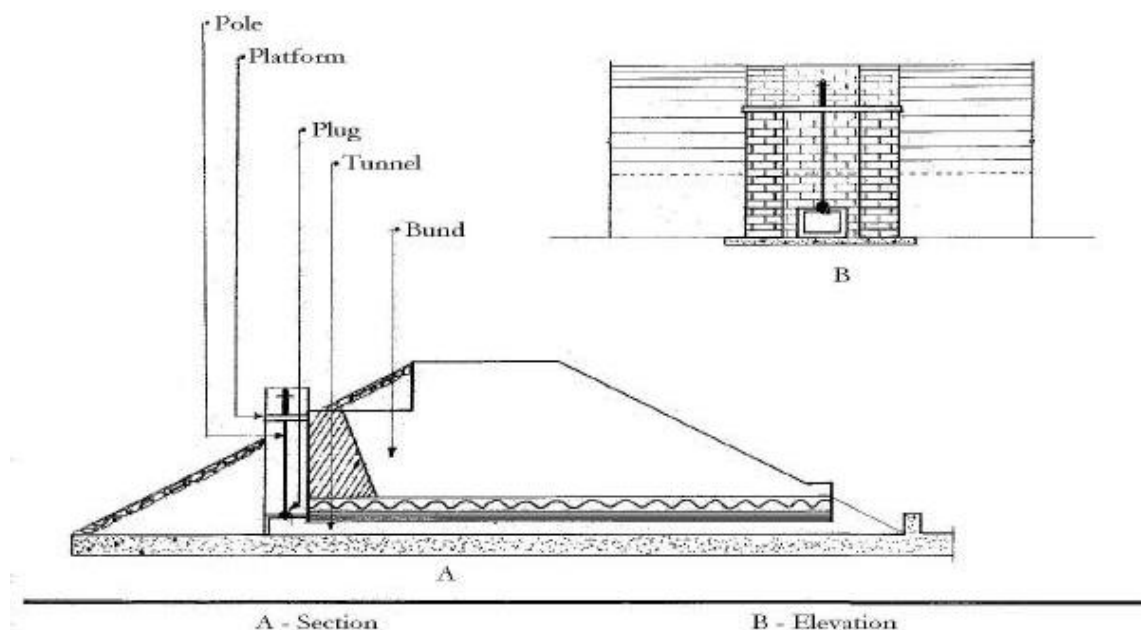
It may not have been a sheer coincidence that water distribution infrastructure such as sluices and distribution canals in many tanks of Shimoga district began to either entirely disappear or were severely modified since the early 1970s. Shimoga district produces the highest amount of rice and has the second largest area under rice in the state of Karnataka. High yielding varieties were first introduced in Shimoga district in 1966/67. According to one survey of two rice-growing areas of the district, all farmers had adopted new varieties by 1972 (Krishnamurthy, 1975). A majority of the landowners of the tanks discussed below adopted the new green revolution rice varieties since the early 1970s, but it took a decade more for a complete shift to the intensive rice cultivation in tank commands. This happened only after the national policy on procurement of rice changed in the early 1980s.

The most apparent shift in the tank designs in this region was the disappearance of water distribution canals and sluice operating mechanisms. A paddy growing command area (locally known as *atchakat*) is usually so designed that it facilitates the movement of water from field to field. Upstream and downstream fields are levelled in such a way that they are irrigated in succession from head to tail. Not only that the design of fields and the position and slope of canals facilitate movement of water in the *atchakat* from upstream to downstream which gives spatial advantage to the fields in the upstream

but the direction of movement of water produces grades of different types of lands in the atchakat. This spatiality of water movement assures repeated and assured supply more to certain patches than others. The favoured patches acquire certain features, owing to their submergence under water for longer duration, which make them progressively more suitable for paddy cultivation. These grades of land reflect the social relations of land holding in the atchakat. During my field work I found that the best land in the atchakat invariably belonged to the historically privileged groups of landowners. As I demonstrate below the power of the landed privileged elites was reproduced in the tank irrigated locality through the shift in the tank designs.

In addition to the disappearance or modification of the distribution network, another major shift in tank designs since the intensification of rice cultivation was the disappearance of sluice operating mechanism. Conventionally, tanks irrigating paddy in Karnataka have the plug and pole type of sluice. See figure 2. Tanks in the wet region like Shimoga with average annual rainfall in the range of 1500 to 2000 mm are relatively small in size and have lower bunds compared to the tanks in the drier or mixed regions with average annual rainfall in the range of 600 to 900 mm and less.<sup>8</sup> The sluice apertures in the tanks of the wet region are located in embankments unlike in the case of bigger tanks in the mixed region where they are located in the water spread area away from the embankments. The sluice in the wet region has been conventionally operated from the platform provided over the opening in the embankment. In several tanks in the Shimoga district, a couple of examples discussed below, the sluice operating mechanism – plug and pole – was stolen or had disappeared all of a sudden in the 1980s. Even when they were replaced, they again went missing.

Figure 2. An engineering line diagram of plug and pole type of sluice (not to scale).

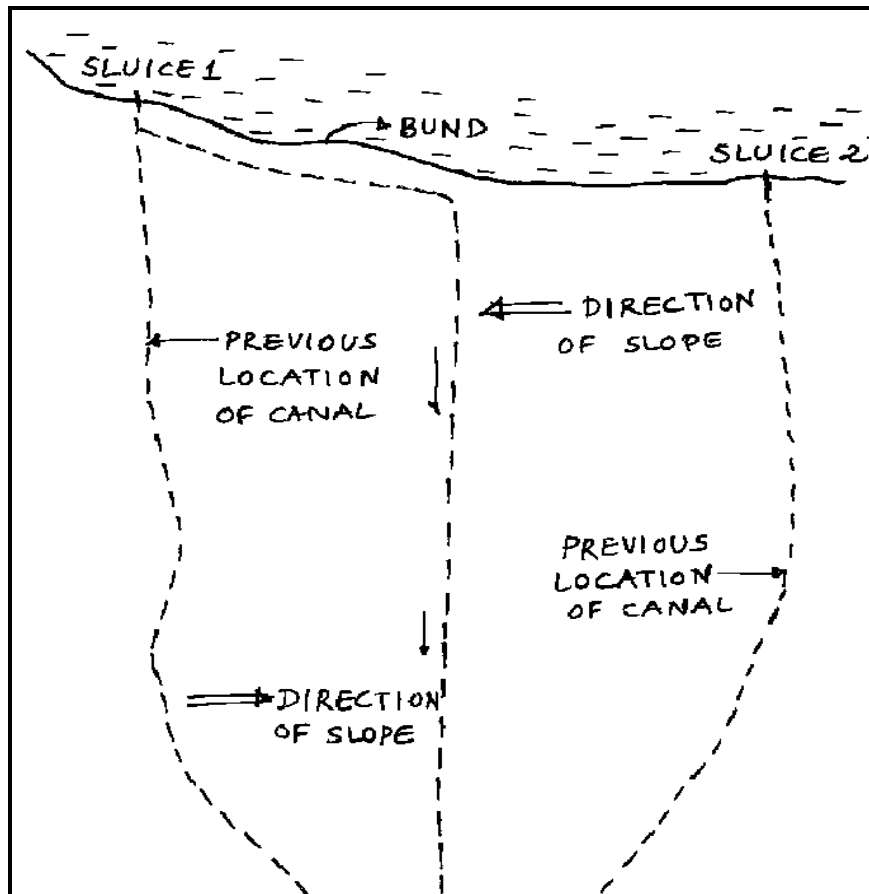


Take, for example, the case of Saulanga old tank in Shimoga district. Three canals – two distribution canals located on the extreme edges of the atchakat that are connected to two sluices and one drainage or seepage canal located in the middle conventionally distributed water in the atchakat (see figure 3). After the introduction of transplanted paddy of the high yielding varieties in the atchakat, the section of the canal became narrower and finally disappeared completely. The seepage canal collected

<sup>8</sup> The categories of wet and mixed regions are constructed to include the interaction between ecological and historical characteristics. See Shah, 2003 for further discussion.

drainage water from the land on both sides and also served as a supply canal to the tail end. Since the intensification of rice cultivation, irrigation in the atchakat was entirely done from field to field, from head to tail. When earlier, water could reach the tail end in a few hours, it now took at least seven to eight days. As a result not only had the amount of tail end land receiving irrigation drastically reduced but also the choice of crops had been severely curtailed. Tail end farmers either plant semi-dry crops or plant early maturing, broadcasted paddy varieties.

Figure 3. A sketch of Saulanga tank atchakat (not to scale).



In the case of another tank called Chinnikatte Taverekere (figure 4), the left bank canal (LBC) on the extreme edge survived, but the seepage canal in the middle that earlier used to take water to the tail end had been heavily encroached upon and silted up as a result its carrying capacity was reduced to one fourth of the original. One more distribution canal on the right bank (RBC in figure 4), had completely disappeared as a result of the encroachment. Sluice 1 of this tank, which used to provide water to the RBC and which was located at a higher level than the rest of the atchakat, had gone out of use. At the time of the field work it supplied water to only a narrow strip of land on the extreme left edge. The entire atchakat eventually received water from the LBC. Water was first distributed to a part of the atchakat called *vari jameen* (upper land) from field to field. The drainage from *vari jameen* was collected in the seepage canal and then distributed to the lower parts of the atchakat called *sara jameen* (lower or seepage land). The tail end received water once in eight days when it needed it every day.

Figure 4. A sketch of Chinnikatte Taverekere atchakat (not to scale).

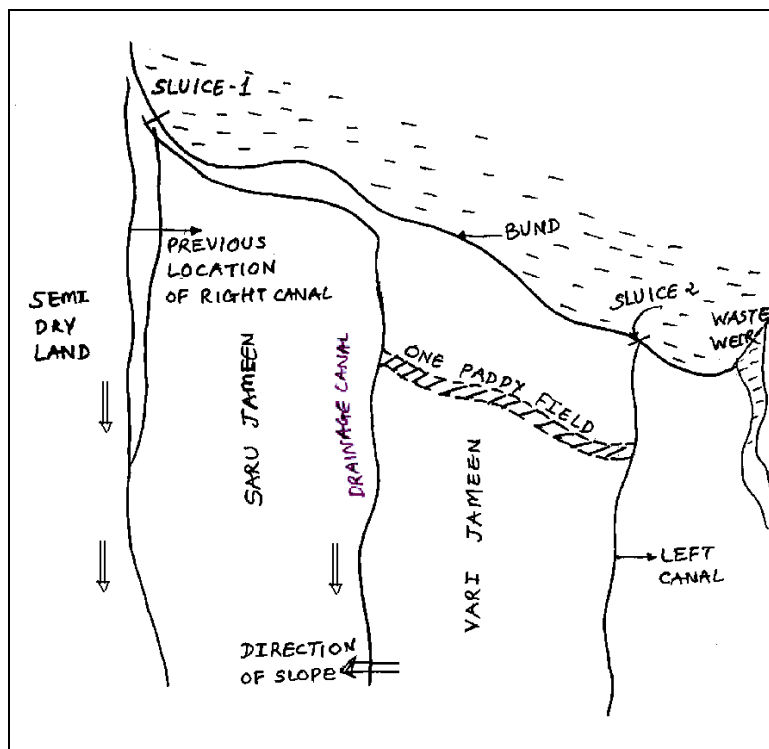
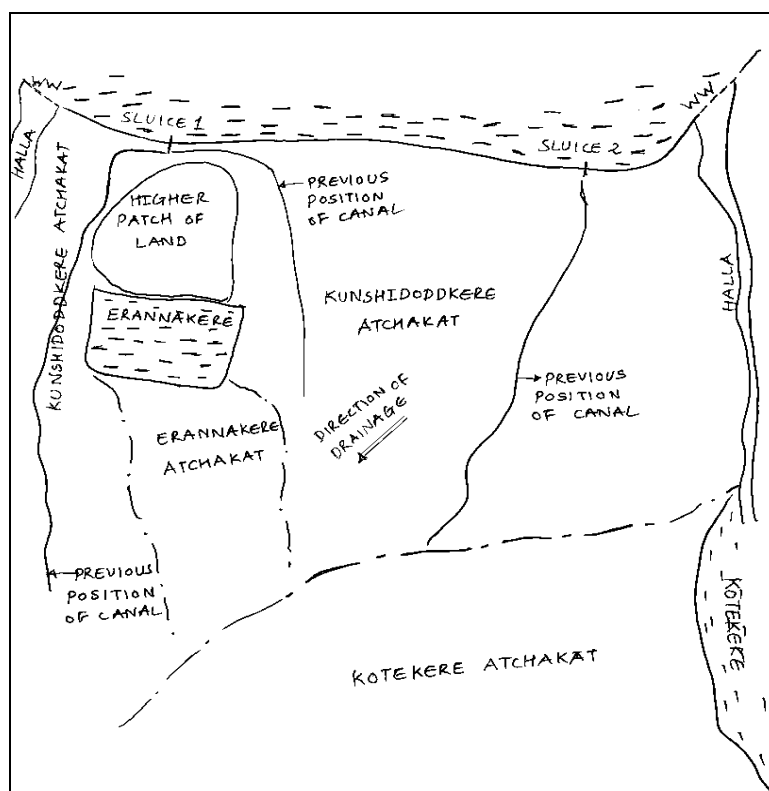


Figure 5. A sketch of Kumsidoddakere atchakat (not to scale).





Similarly, the plug and pole arrangement of the sluice disappeared soon after the introduction of the green revolution varieties, ironically soon after it was repaired and replaced by the PWD (Public Works Department). Before this period the sluice had a heavy plug, which used to be opened three to four times in the irrigation season. Each time the sluice was opened, it was kept open for a few days until the entire atchakat was irrigated, and again closed until the next round of irrigation. The plug and pole of the sluice existed for a long time, until only after the intensification of paddy cultivation. The sluice since was stuffed with gunny bags and paddy stems before the rainy season, opened in July, kept open for the entire paddy season, again stuffed in October, opened in January, and closed before the rainy season.

Yet another tank, Kumsidoddakere, had neither distribution canals nor sluice operating infrastructure at the time of the fieldwork. The wooden plug and pole existed, until the early 1970s, until the tank was managed by the village level revenue officers – Patel and Shanbhoga. In 1971, the tank was handed over to the PWD when officially the Patel and Shanbhoga stopped being responsible for the tank. This happened at almost the same time the new paddy varieties were introduced in the atchakat. The distribution canals existed at places shown in figure 3. Tail end farmers of this tank alleged that soon after the tank was taken over by the PWD the powerful farmers of the head reach, including the Patel and Shanbhoga, first encroached upon the canals and later even destroyed the remaining part. Destroying canals ensured that water was first supplied to the head reach and reached the tail end only if it was allowed to.

This shift in the state of the crucial water distribution infrastructure, in the tanks discussed above, does not seem to be the case of the deterioration of physical structures as a result of the lack of proper management or maintenance. Instead, in all tanks, the disappearance of canals and sluice operating mechanism were sudden and related to the introduction of green revolution rice varieties and also to the shift in the state irrigation policy. It is hard to comprehend why it would be difficult for farmers to replace this part of the tank infrastructure if needed. The plugs and poles were routinely replaced by farmers in other parts of the state, and once replaced, they could easily last for twenty years. When I asked farmers how difficult it would be to replace the plug and pole, the answer was, "it would be futile to do so as they would be stolen again". Cleaning and mending of especially earthen canals do not require either sophisticated technical assistance or capital investment. Repair or reconstruction of any type of earthen or masonry work such as the embankment, the stone revetment, the sluice platform or the waste weir superstructure were difficult operations, hard for farmers to handle on their own. Desilting of tank submergence area was another difficult operation, which needed an organised form of technical assistance. Farmers, however, routinely handled repairing and cleaning canals and replacing plugs and poles of sluices.

The disappearance of the irrigation infrastructure was related to the political economy of a changing cropping pattern and the shifting power relations at the local level. Farmers I interviewed narrated the change in terms of "before, when only broadcasted paddy was cultivated, and after, when all farmers began to grow transplanted paddy of new varieties". I maintain the same distinction to narrate the process of change over this period.

Tanks in the wet region of Shimoga district have a small capacity compared to the size of tanks in other regions because tanks here fill up several times during one monsoon season, which is also the irrigation season. Also, tanks in this region have sufficient capacity for irrigating their atchakats once. Earlier, paddy was usually sown in the last week of May by throwing dry seeds on the land that sprouted after the arrival of the first showers. The sluices were opened by a Talwar (a village servant) one and half months after sowing with the permission from Shanbhoga and that too was postponed if there was enough rain. Water was supplied three times during the whole season. Water thus was distributed intermittently and not continuously and was also rotated between the tail end and head reach. The presence of canal/s was absolutely crucial to ensure rotation. Almost all tank-irrigated areas also had a seepage or drainage canal that carried excess water from the head reach to tail end, which rotated water between the head and tail end which also carried irrigation return flow to the

downstream tank. One round of irrigation took 15 to 20 days depending upon the size of the atchakat. Sluices were operated during the irrigation round – opened in the morning and closed in the evening. For intermittent rounds of irrigation, the sluice operating mechanism was kept in order, as each round of irrigation would practically empty a tank. Sluice/s also had to be closed to store the next round of inflow till the next round of irrigation.

After the intensification, irrigation was provided as per the requirements of transplanted paddy. Sluice outlets were stuffed with gunny bags, paddy stems, stones and mud before the beginning of the rainy season. They were opened at the time of land preparation and transplantation when broadcasted paddy in the tail end would be one and half to two months old and would require water. After the completion of the first round of irrigation and depletion of water in the tank, sluices were again closed with gunny bags, stones and paddy straw until the second round of irrigation. This method of sluice control was fairly labour intensive, at times it even took two days to entirely remove all the material stuffed inside the sluice openings. Only farmers growing transplanted paddy closed and opened the sluice outlets with the help of hired labour whom they pay from their own pocket. Once opened, sluice/s were kept open for the rest of the season because closing them under water was very difficult. Transplanted paddy needed continuous supply and drainage during the maturing season except in the first month. Hence sluice/s were again closed only at the end of the season. The disappearance of the canals and the sluice operating mechanism ensured that water was supplied to the tail end, field to field, only via the head reach and according to the requirements of transplanted paddy, completely negating the possibility of rotation between head reach and tail end. Thus, the disappearance of crucial water distribution structures ensured that water was supplied according to the requirements of transplanted paddy grown in the privileged patches in the atchakat.

The disappearance of essential infrastructure also signifies erosion of social relations of power that previously maintained them. Nadkarni (1987), while discussing the class character of the farmers' movement of the 1980s, noted that, "the landlords had a sense of security in the feudal order, which today's rich peasants do not necessarily have" (Nadkarni, 1987). The disappearance of the crucial physical structures marked the breaking down of the old managerial order in which the elites seemed to no longer have a stake. Their earlier involvement with the management and maintenance of the physical structures earned them a right to be part of the power-holding and decision-making authority, which in turn ensured that their interests were protected. After the intensification, as long as they had land that was located in the privileged part of the atchakat that received assured irrigation, they became not only apathetic to the management and maintenance of the physical structures but, as several examples of tanks in Shimoga district show, they actually contributed to destroying some of the structures in order to remain in the privileged position.

The erosion of such feudal power relations had another side too. On the one hand, the farmers' movement of the 1980s intensely affected the corridors of power at the state level and since had also influenced the ruling governments and the national policy on price of agricultural output. On the other hand, it also resulted in the loss of external government authority to even nominally interfere and create a normative structure of order at the village level. This perhaps was the most evident in Shimoga district, the heartland of the new farmers' movement. One of the important strategies of the movement in the 1980s was to expose corruption in public life and oppose the attachment of farmers' property by government officers in lieu of loan recovery. In several occasions the government officials were prevented from entering the village (Assadi, 1997).<sup>9</sup> The farmers' agitations were in response to the high handedness of government officers and their corrupt practices. The success of the agitations

<sup>9</sup> The local bureaucrats, especially from the Irrigation and Revenue Departments, were targets of the farmers' fury during these agitations. Their officers and files were burnt at times as part of the agitation, for instance in the Malaprabha agitation (Nadkarni, 1987). The government officers who came to attach farmers' property to recover loans were hackled routinely, and were at times locked up following the strategies adopted by Punjab farmers. Many villages were declared as no-entry zones for the government officers (Assadi, 1997). Pitched battles were fought between the KRRS (Karnataka Rajya Rayta Sangh – the farmers' organisation) squad and government officers. At times some officers refused to enter certain villages (Assadi, 1997).

increased the power of the landed and elite farmers, especially sugarcane and paddy-growers, to new heights. This farmers' alliance succeeded in suspending the normative structures of state authority at the local level.

## CONCLUSION

The idea of the pre-modern holding an agency of hegemony's other became influential in India since the debates in the 1980s on the large dam on river Narmada. The debate had many manifestations. A large part of the literature, on the one hand, poses the pre-modern or traditional forms of irrigation as a viable alternative to the modern forms of water management (Agarwal and Narain, 1997). A number of scholars on the other hand pointed out how the framing of independent India's dominant hydraulic models amplified colonial legacy which relentlessly extinguished other forms of cultures and traditions for managing and conserving water (D'Souza, 2008). This legacy, Zwarteveen traces to the construction of hegemonic masculinities and irrigation cultures since colonial times (Zwarteveen, 2011). In both these incarnations, the dominant modern is evaluated and critiqued in the light of the 'outsider' – pre-modern – other.

In a similar vein, a significant part of the influential critiques of modernity, the modern state, or modern science and technology – for example, in the works of James Scott, Stephen Lansing, and Sandra Harding – are premised on the assertion that the pre-modern was environmentally non-intrusive and harmoniously embedded within a culture. The way these critiques pose the substantive distinction between the modern and the pre-modern through the reading of technology and knowledge systems insufficiently engages, I argue, with the history of pre-modern technology and knowledge creation. Tank irrigation technology, with all its presumed-appropriate attributes – small, decentralized, traditional, Eastern, and local – is often touted as an ideal example of an ecologically embedded and socially suitable pre-modern technology.

Going beyond the dichotomy of pre-modern and modern forms of knowledge with mutually opposing attributes, I have shown here how a situated position – seeing like a subaltern – can help build a complex history of tank irrigation technology. In doing so, I have shown how in both pre-modern and modern times the reproduction of technology implies the reproduction of cultural politics and power relations in distinct ways. I want to emphasize the following points as a way of conclusion.

Firstly, tank irrigation technology has not necessarily produced a democratic social order, either in the past or in the present. Even when the state and polity in pre-modern South India had little in common with the modern territorial state and its concepts of sovereignty, exploration of the state-society-technology relationship reveals an increasingly extractive statecraft involving coerced labor; the expropriation of surplus by elites; and the spread of technological choices that could be environmentally unsound – and that often resulted in forced displacement, uncertainty, technological vulnerability, and social anxiety and violence. Morrison in her recent work comes to the same conclusion by referring to archaeological and historical evidence. By reconstructing the historical development of irrigation and agriculture in sixteenth century, Morrison shows how incidents of both catastrophic dam failures and construction of new ones led to significant forms of devastation and displacement (Morrison, 2009). She also shows how river-fed canals and canal-fed reservoirs were dedicated to the production of commercial cash crops as early as the fourteenth century (Morrison, 2010). Thus, tanks as artefacts were socially embedded in societies and economies that were organized for warfare, sustained sharp social hierarchies, and were often violent to women and people from lower castes. Clearly, the tank as a techno-sociological artefact was integral to the forms of inequality and violence of the pre-modern social order in South India. While not denying the substantive differences between the pre-modern and modern forms of irrigation technology in terms of size, scale and spread, what this essay asserts is that seeing like a subaltern and based on the empirical inquiry into the social shaping of tank technology in the pre-modern and modern historical periods, it would be difficult to find any fundamental *ontological* contrast between a pre-modern and a modern technology.

The fundamental problem with the great divide between modern and pre-modern knowledge systems is that such a concentration *attributes* values and ethics to the artefacts and knowledge systems and thereby reifies them, denying their social shaping. This article argues instead that values emerge from historically situated actors and not solely from the artefacts or knowledge systems themselves.

Secondly, in modern times as well, tanks reinforce and reproduce the power relations at the heart of the agrarian economy, as does any other modern irrigation technology. Tank technology has been perfectly amenable to the significant transformations heralded by the Green Revolution – one of India's most important state-sponsored, modern science- and technology-driven development projects. In my own extensive field work on tank designs in Karnataka, I found that the irrigation from the functioning tanks has intensified, expanded, and thrived since the introduction of the Green Revolution. In these tanks in many parts of Karnataka the designs of tank technology have undergone modernisation initiated and implemented by the farmers themselves. Several chapters in my earlier work describe in detail these processes of modernisation and expansion (Shah, 2003). This shift in tank designs since the Green Revolution has created, perpetuated, and reproduced new power relations.<sup>10</sup> Therefore, in radically different ways, but nevertheless, tank technology has reproduced cultural politics and power relations in both pre-modern and modern periods.

Thirdly, a plea to abolish the great divide between knowledge systems is not meant to suggest that technologies may not differ in their social implications. In fact, this article argues that technologies shaped in radically different social and political systems have different impacts upon society. A rigorous understanding of these differences is critical for comparing, assessing, and evaluating technologies of different eras. Ultimately, technological artefacts are not inert objects. They articulate with a complex mix of social tensions, relations, power, and ideology and transform with historical processes. Those who advocate pre-modern artefacts and knowledge systems as objects of value and virtue fail to capture their social and political scripting and ultimately deny the historical embeddedness of technology.

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<sup>10</sup> See several chapters in Shah (2003) for further discussion on the way in which tank technology and tank irrigation policy have changed as a result of the recursive – that is, mutually transforming – roles played by the state and society in the political economy of agrarian change.

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